APPLICATION FOR PATENT

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Title: Inflatable three-dimensional display

FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to an inflatable three-dimensional display and, in particular, it concerns an inflatable three-dimensional display with a projector disposed eccentrically therein.

Of most relevance to the present invention is U.S. Patent No. 2,592,444 to J.J. Matelena, wherein the invention relates to an inflatable balloon with a centrally placed projector.

A shortcoming of the aforementioned system is that the size of the display only covers a small area on each side of the balloon and therefore a majority of the balloon is not utilized for display purposes. Moreover, the three-dimensional effect that is produced by having the display cover the majority of the balloon is very attractive and enhances the display's effectiveness.

Another shortcoming of the aforementioned system is that the balloon has a weak support structure and may be damaged during windy conditions. If the balloon is used for outdoor use, its size will need to be restricted to prevent wind damage thereby reducing the overall display effect.

A further shortcoming of the aforementioned system is that the display is mainly for use at night or in darkened surroundings.

The latter shortcoming is addressed by U.S. Patent No. 5,570,138 to Baron. Baron describes a surface for displaying a non-projected image during the daytime and a projection screen apparatus that automatically unrolls to present a projection screen for displaying a projected image during the nighttime. However, a shortcoming of Baron is that the screen is not three-dimensional. A further shortcoming of Baron is that the projector needs to be placed in front of the screen and therefore the possibilities for physical positioning of the display are limited.

Also of relevance to the present invention is U.S. Patent No. 5,612,741 to Loban et al. and U.S. Patent No 4,323,301 to Spector. Loban et al. describes a video billboard with an internal projector. Spector describes a collapsible rear or front projection screen assembly. A shortcoming of both these systems is that the screens are not three-dimensional.

Also of relevance to the present invention is U.S. Patent No 4,802734 to Walter. Walter describes an inflatable screen of fabric that has an envelope with a front flat surface that serves as a screen. The envelope needs to be tied to a substrate in several places in order to provide a rigid structure for the screen. The envelope also contains a number of flexible strips that extend from the floor to the roof of the envelope to help maintain the general shape of the inflatable screen. Although, this invention claims that the envelope can be a balloon shape, this embodiment is not described. Moreover, the placement of the necessary flexible strips inside a balloon will limit the placement of the

projector, as the flexible strips will block the projection of the display. Also, it is difficult to tie down a balloon by several points to provide a rigid structure as described by this patent. In addition, tying the balloon to a substrate severely limits its physical placement. Moreover, the projector rests on the floor of the envelope, as the invention does not provide a support means for the projector. Therefore, the projector will rest on the floor of the balloon and will severely limit the size of the resultant display. Also, the projector will not be steady.

Moreover, all the above inventions do not address problems relating to use of the screen during windy conditions.

There is therefore a need for an inflatable three-dimensional display, which provides a large, attractive and steady display that is usable day and night, is set up easily in many locations and deals with problems caused by wind conditions.

SUMMARY OF THE INVENTION

The present invention is an inflatable three-dimensional display construction.

According to the teachings of the present invention there is provided, an inflatable display comprising: (a) an inflatable balloon; (b) a projector having a projection lens; (c) an internal support structure that supports: (i) the inflatable balloon; and (ii) the projector so that the projection lens is eccentrically disposed within the inflatable balloon; and (d) an external support structure that supports the internal support structure.

According to a further feature of the present invention the inflatable balloon has a first side and a second side and the projection lens is deployed within the first side to project onto the second side.

According to a further feature of the present invention, the inflatable balloon has a central axis and the projection lens is deployed within the inflatable balloon eccentric to the central axis.

According to a further feature of the present invention, the internal support structure can rotate in relation to the external support structure.

According to a further feature of the present invention, the external support structure is mechanically connected to the internal support structure substantially on the central axis.

According to a further feature of the present invention, the internal support structure includes: (a) a curved support member that is mechanically connected to the inflatable balloon; and (b) a support arm that is mechanically connected to both the curved support member and the projector.

According to a further feature of the present invention, the curved support member assumes the configuration of a closed loop.

According to a further feature of the present invention, the curved support member assumes the configuration of a ring.

According to a further feature of the present invention, the closed loop is configured to fold; and the internal support structure further includes a folding mechanism.

According to a further feature of the present invention, the folding mechanism includes a linear actuator.

According to a further feature of the present invention, there is also provided: (a) a wind gauge; and (b) a control circuitry that is configured to control the folding mechanism in response to an output of the wind gauge.

According to a further feature of the present invention: (a) the support arm includes a first support arm, a second support arm, a third support arm; (b) the second support arm includes a first portion and a second portion that are connected by a first hinge; and (c) the third support arm includes a third portion and a fourth portion that are connected by a second hinge.

According to a further feature of the present invention, the support arm includes a fourth support arm.

According to a further feature of the present invention: (a) the first support arm and the fourth support arm substantially lie in a first plane; and (b) the second support arm lies in a second plane and the third support arm lies in a third plane, wherein the second plane is substantially parallel to the third plane and the second plane is substantially perpendicular to the first plane.

According to a further feature of the present invention, the projector is disposed between the second plane and the third plane.

According to a further feature of the present invention, the folding mechanism includes: a first linear actuator that is mechanically connected to the first portion and the second portion; and a second linear actuator that is mechanically connected to the third portion and the fourth portion.

According to a further feature of the present invention: (a) the inflatable balloon has a first section and a second section; and (b) an attachment configuration for attaching and detaching repeatably at least one of the first section and the second section to the closed loop.

According to a further feature of the present invention, there is also provided an inflator deployed to pump air from outside of the inflatable balloon to inside the inflatable balloon.

According to a further feature of the present invention, the inflatable balloon is substantially spherical.

According to a further feature of the present invention, there is also provided a counterweight that is deployed to counter a turning moment caused by the internal support structure and the projector.

According to a further feature of the present invention, there is also provided a non-projected image and wherein the inflatable balloon has an outer surface and thereon disposed is the non-projected image.

According to a further feature of the present invention, there is also provided: (a) a light sensor; (b) a motor configured to rotate the inflatable balloon; and (c) a control system that is configured to control the motor in response to an output of the light sensor in order to turn the non-projected image towards a viewing direction by day and to turn the non-projected image away from a viewing direction by night.

According to the teachings of the present invention there is provided, a method to control an inflatable display according to wind conditions, the

inflatable display comprising an inflatable balloon and a projector disposed inside the balloon, the method comprising the steps of: (a) operating in a sensing mode by: (i) sensing for a preset maximum wind speed; and (ii) maintaining inflation of the inflatable display; (b) operating in a collapsing mode by: (i) reducing inflation of the inflatable display; and (ii) collapsing an internal support structure that is mechanically connected to the inflatable display; and (c) operating in a recovery mode by: (i) reestablishing the internal support structure; and (ii) increasing inflation of the inflatable display.

According to a further feature of the present invention, the step of collapsing is performed by collapsing an internal support structure that is mechanically connected to the inflatable display by activating at least one linear actuator that is mechanically connected to the internal support structure.

According to a further feature of the present invention, there is also provided, prior to the step of reestablishing, the step of sensing for a wind speed below a second preset maximum.

According to a further feature of the present invention, there is also provided, prior to the step of reestablishing, remotely transmitting a signal to initiate the recovery mode.

According to a further feature of the present invention, the inflatable display is substantially spherical.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

Fig. 1 is an isometric view of an inflatable three-dimensional display that is constructed and operable in accordance with a preferred embodiment of the invention;

Fig. 2 is a front view of the inflatable three-dimensional display of Fig. 1;

Fig. 3 is a side view of the inflatable three-dimensional display of Fig. 1;

Fig. 4 is a plan view of the inflatable three-dimensional display of Fig. 1;

Fig. 5 is an enlarged view of the region indicated by the letter A in Fig. 4;

Fig. 6 is an enlarged view of the region indicated by the letter A in Fig. 2;

Fig. 7 is an enlarged view of the region indicated by the letter A in Fig. 3;

Fig. 8 is an enlarged view of the region indicated by the letter B in Fig. 4;

Fig. 9 is an enlarged view of the region indicated by the letter C in Fig. 4;

Fig. 10 is an enlarged view of the region indicated by the letter D in Fig. 4;

Fig. 11 is an enlarged view of the region indicated by the letter E in Fig. 4;

Fig. 12 is a schematic side view of the inflatable balloon of Fig. 1 being suspended;

Fig. 13 is a schematic side view of the inflatable balloon of Fig. 1 being supported from below;

Fig. 14 is a plan view of the inflatable three-dimensional display of Fig. 1 in its collapsed state;

Fig. 15 is a schematic representation of the operation of a system for controlling an inflatable display according to wind conditions that is operable in accordance with a preferred embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is an inflatable three-dimensional display construction.

The principles and operation of the inflatable three-dimensional display according to the present invention may be better understood with reference to the drawings and the accompanying description.

By way of introduction, there are many problems involved in providing a three-dimensional display. Firstly, the size of a displayed image needs to cover a large part of the surface of the available screen. This can be achieved by placing the projector eccentrically in the display. However, placing the projector eccentrically creates additional problems. For example, where the

display is a balloon or sphere, the display will be unbalanced due to the weight of the projector not being at the center of gravity of the display. Secondly, an internal support structure must be strong enough to support the display and the projector. However, the internal support structure must be designed so as not to block the projection of the displayed images and at the same time to secure the projector eccentrically in the display. Thirdly, the internal support structure must be able to collapse and thereby fold and support the display during windy conditions and during transportation of the display. Fourthly, the internal and external support structure of the display should enable the display to rotate on an axis.

Reference is now made to Fig. 1, which is an isometric view of an inflatable three-dimensional display **10** that is constructed and operable in accordance with a preferred embodiment of the invention. Inflatable three-dimensional display **10** includes an inflatable balloon **15** that has a central axis **17**, a projector **20** having a projection lens **23**, an internal support structure **25** and an external support structure **30**. Internal support structure **25** supports inflatable balloon **15** and projector **20** so that projection lens **23** is eccentrically disposed inside inflatable balloon **15** in relation to central axis **17**. External support structure **30** supports internal support structure **25**.

Inflatable balloon **15** is formed from two sides **35** and **40**. In the most preferred embodiment of the invention inflatable balloon **15** is substantially spherical and sides **35** and **40** are substantially equal. A non-projected image (not shown), for example an advertisement, is disposed on the outer surface of

side **35**. Side **35** is made of a material that is suitable to dispose a non-projected image thereon, using rear projection techniques. The non-projected image can be changed periodically as needed. Side **40** is made of material that is suitable to have a projected image thereon. Projector **20** is disposed so that projection lens **23** is internal to side **35** to enable the projected image to appear on side **40** and to cover the majority of side **40**. Inflatable balloon **15** includes a control system that is configured to control a motor **45** in response to the output of a light sensor **50**, so that side **35**, with the non-projected image, faces a viewing direction by day and side **40**, with the projected image, faces the viewing direction by night. It should be noted that whenever inflatable balloon **15** is required to rotate, as described above, inflatable balloon **15** typically rotates by a maximum of 360-degrees in one direction. When inflatable balloon **15** needs to rotate to another position, it rotates in the opposite direction by a maximum of 360-degrees. This is to ensure that the electrical and communication cables that feed into inflatable balloon **15** do not become over-twisted and thereby break. If it is necessary for inflatable balloon **15** to rotate more than 360-degrees a mechanism (not shown) is installed to enable inflatable balloon **15** to rotate more than 360-degrees without the risk of breaking electrical and communication cables. Inflatable balloon **15** is also configured to rotate continually about central axis **17** in one direction by approximately 15-degrees and then in the other direction by approximately 15-degrees, during the day, to attract the attention of viewing public. An inflator **55**, that is typically electric, is disposed within inflatable balloon **15**. Inflator **55** helps maintain the shape of

inflatable balloon **15** by pumping air from outside of inflatable balloon **15** to inside inflatable balloon **15**.

Any type of projector is suitable for use with inflatable three-dimensional display **10**. Projector **20** is typically a video projector or a slide projector. The images produced by projector **20** are typically controlled by a computer connected to a mobile phone or other wireless device, so that the images displayed can be updated remotely. Other manual methods can be deployed such as using videotapes that are periodically changed manually. The lens (not shown) of projector **20** is typically configured as a wide-angle lens to reduce distortion of the projected image at the curved edges of side **40**. Remote focusing of the lens of projector **20** can be configured if needed.

Internal support structure **25** is configured to support projector **20** and to provide support for inflatable balloon **15**. Internal support structure **25** is also configured to fold when needed using a folding mechanism that is driven by linear actuators. The majority of internal support structure **25** is disposed within inflatable balloon **15**.

Reference is now made to Figs. 2, 3 and 4, which are various views of inflatable three-dimensional display **10**. Internal support structure **25** includes a curved support member assuming a closed loop configuration. In the most preferred embodiment of the invention, inflatable balloon **15** is substantially spherical and the closed loop assumes a substantially circular configuration of a ring **60**. Ring **60** is mechanically connected to inflatable balloon **15** along

substantially the complete circumference of ring **60** at the position where side **35** and side **40** overlap.

Reference is again made to Fig. 2. Ring **60** is configured to fold around central axis **17** by forming ring **60** from an upper hinge element **65**, a lower hinge element **70** and two curved elements **75** and **80**. Curved elements **75** and **80** are substantially semi-circular. Curved elements **75** and **80** are typically formed from elongated hollow metal tubes with a substantially rectangular cross-section that are bent along their direction of elongation.

Reference is now made to Fig. 5, which is an enlarged view of the region indicated by the letter A in Fig. 4. Upper hinge element **65** is typically formed from a solid metal plate with a substantially rectangular cross-section with a hinge **85** at one end of the metal plate and a hinge **90** at the other end of the metal plate.

Reference is now made to Fig. 6, which is an enlarged view of the region indicated by the letter A in Fig. 2. Lower hinge element **70** is typically formed from a solid metal plate with a substantially rectangular cross-section with a hinge **95** at one end of the metal plate and a hinge **100** at the other end of the metal plate. It should be noted that hinges **85**, **90**, **95**, **100** are typically of substantially the same form.

Reference is again made to Fig. 2. Curved element **75** is connected, typically by welding, to hinge **85** and hinge **95**. Curved element **80** is connected, typically by welding to hinge **90** and hinge **100**. Ring **60** is needed

to ensure that inflatable balloon **15** is adequately supported and to prevent tearing of the fabric of inflatable balloon **15**.

Reference is again made to Figs. 1, 2, 3 and 4. Internal support structure **25** also includes four support arms **105**, **110**, **115** and **120** and a bracket **125** each typically being formed from elongated hollow metal tubes with a substantially rectangular cross-section. Support arms **105**, **110**, **115** and **120** are each connected to ring **60** and to bracket **125**. Internal support structure also includes a support plate **126** and a support arm **127**. Support arm **127** is typically formed from an elongated hollow metal tube with a substantially rectangular cross-section. Bracket **125** is mechanically connected to the rear of projector **20**. Support arm **127** is connected to support arm **110** and to support plate **126**. Support plate **126** is substantially horizontal and supports the base of projector **20**. Bracket **125** is optimally disposed, with its elongated direction in a vertical position, as close to side **35** as possible and substantially at the center of side **35**. The optimal positioning of bracket **125** enables the optimal positioning of projector **20** so that projection lens **23** is as far away from side **40** as possible and projection lens **23** is positioned opposing the center of side **40**.

Reference is again made to Fig. 3 and 5. One end of support arm **105** is connected to the center of upper hinge element **65**, typically by welding, and the other end of support arm **105** is connected to the top of bracket **125**, typically by welding.

Reference is now made to Fig. 7, which is an enlarged view of the region indicated by the letter A in Fig. 3. Reference is also made to Fig. 3. One end of support arm **110** is connected to the center of lower hinge element **70,** typically by welding; the other end of support arm **110** is connected to the bottom of bracket **125**, typically by welding.

Reference is again made to Fig. 4. One end of support arm **115** is connected to curved element **75** by a hinge **130** and the other end of support arm **115** is connected to the bottom of bracket **125** by a hinge **135**.

Reference is now made to Fig. 8 and 9. Fig. 8 is an enlarged view of the region indicated by the letter B in Fig. 4. Fig. 9 is an enlarged view of the region indicated by the letter C in Fig. 4. Reference is also made to Fig. 4. One end of support arm **120** is connected to curved element **80** by a hinge **140** and the other end of support arm **120** is connected to the top of bracket **125** by a hinge **145**.

Reference is again made to Fig. 4. Support arm **115** includes two portions **146**, **147** that are connected using hinge **150**. A support plate **152,** which is substantially rectangular, is connected, typically by welding, to portion **146** on the side of support arm **115** that is opposite hinge **150,** so that support plate **152** overlaps both portions **146** and **147**. The above is to prevent support arm folding **115** folding in two directions and to further strengthen internal support structure **25**. A linear actuator **155** is attached to portions **146, 147** to enable automatic folding of support arm **115**. Linear actuator **155** typically contains a piston and cylinder. The piston is typically

moved in and out of the cylinder by fluid pressure within the cylinder or by a solenoid or by a motor driven mechanism. Linear actuator is not limited to the above examples and can also take other forms in order to perform the same function.

Reference is now made to Fig. 10, which is an enlarged view of the region indicated by the letter D in Fig. 4. Support arm **120** includes two portions **156, 157** that are connected by hinge **160**. A support plate **162**, which is substantially rectangular, is connected, typically by welding, to portion **156** on the side of support arm **120** that is opposite hinge **160**, so that support plate **162** overlaps both portions **156** and **157**. The above is to prevent support arm folding **120** folding in two directions and to further strengthen internal support structure **25**.

Reference is again made to Fig. 4. A linear actuator **165** is attached to portions **156**, **157** of support arm **120** to enable automatic folding of support arm **120**.

Reference is again made to Figs. 2, 3 and 4. Support arms **105, 110** substantially lie in a same plane. Support arms **105, 110** typically have a length that is considerably greater than their widths and therefore in common usage it is reasonable to say that the elongated direction of the support arms lie in a plane. Support arms **115, 120** lie in planes that are substantially parallel. The planes of support arms **115, 120** are substantially perpendicular to the plane of support arms **105, 110** as well as the plane of ring **60**. The plane of ring **60** is also substantially perpendicular to the plane of support arms **105, 110**. Support

arm **115** is below projector **20** and support arm **120** is above projector **20**, thereby enabling internal support structure **25** to fold more completely during windy conditions. It is possible that support arms **115** and **120** be in the same plane, however, in the most preferred embodiment of the invention they are in different parallel planes as described above.

Reference is again made to Figs, 3 and 4. It should be noted that internal support structure **25**, which includes ring **60**, support arms **105**, **110**, **115**, **120** and bracket **125** do not block the projection of images by projector **20** onto side **40**. However, ring **60** in combination with support arms **105**, **110**, **115**, **120** and bracket **125** ensure that projector **20** is kept steady in relation to inflatable balloon **15**.

Reference is again made to Fig. 2. One end of a top rod **167** is connected, typically by welding, to the top of upper hinge element **65** so that the elongated direction of top rod **167** is substantially vertical. One end of a bottom rod **168** is connected, typically by welding, to the bottom of lower hinge element **70** so that the elongated direction of bottom rod **168** is substantially vertical. It should be noted that bottom rod **168** is hollow to enable electrical cables and communications cables to be fed into inflatable balloon **15** through bottom rod **168**.

Reference is now made to Fig. 11, which is an enlarged view of the region indicated by the letter E in Fig. 4. As explained above, inflatable balloon **15** is formed from two substantially equal sides **35** and **40**. Sides **35**, **40** are typically formed from smaller sections that are joined together. The

material used for sides **35**, **40** should be waterproof and sun resistant to prevent water damage to inflatable balloon **15**. As mentioned above with reference to Fig. 1, side **40** is also made of a material that is suitable for rear projection. PVC fabric with ultraviolet protection is typically used as it provides waterproofing, sun resistance, it can be welded together and it can be printed on. Sides **35**, **40** are attached to ring **60** using an attachment configuration providing a strong, water-resistant and flexible method for repeated attachment and detachment. This is typically achieved by Velcro. Side **40** is attached to ring **60**. Side **35** is attached to side **40**. The overlap of side **35** and side **40** is typically 5cm. A strip of Velcro loops **170** is connected, typically by adhesive and rivets, to substantially the entire outer circumference of ring **60**. A strip of Velcro hooks **175** is connected, typically by adhesive, welding or sewing, to substantially the entire inner edge of side **40**. A strip of Velcro loops **180** is connected to substantially the entire outer edge of side **40**. A strip of Velcro hooks **185** is connected to substantially the entire inner edge of side **35**. Inflatable balloon is attached to ring **60** by fastening strip of Velcro loops **170** to strip of Velcro hooks **175** and strip of Velcro loops **180** to strip of Velcro hooks **185**. Sides **35**, **40** each have a zip (not shown) starting from the bottom of their side to ease attachment and detachment of inflatable balloon **15**. Side **35** also has a zip (not shown) close to projector **20** (Fig. 3) to enable easy access to projector **20**. Sides **35** and **40** are secured to ring **60** in a plurality of locations thereon, with a bolt **190**. Bolt **190** goes through strips of Velcro **170, 175, 180, 185** and sides **35**, **40**.

Reference is again made to Fig. 3. External support structure **30** ensures that inflatable balloon **15** is held steady. External support structure **30** typically includes two horizontal beams, a lower beam **195** below inflatable balloon **15** and an upper beam **200** above inflatable balloon **15**. Lower beam **195** and upper beam **200** are mechanically connected by a vertical beam **210**. A diagonal support beam **215** mechanically connects lower beam **195** and vertical beam **210**. A diagonal support beam **220** mechanically connects upper beam **200** and vertical beam **210**. Lower beam **195** is mechanically connected to a mast **225**. Mast **225** is sunk into a substrate (not shown). Beams **195**, **200**, **210**, **215**, **220** are typically elongated hollow metal tubes with a substantially rectangular cross-section.

Reference is again made to Fig. 2. External support structure **30** is rotatably connected to internal support structure **25** substantially on central axis **17** at the top **230** and bottom **235** of inflatable balloon **15**. This is achieved by making two holes **240,** one in the topside of upper beam **200** and one in the bottom side of upper beam **200,** both holes being in vertical alignment with each other. Top rod **167** is disposed in upper beam **200** through holes **240**. Two holes **245** are made in lower beam **195,** one in the topside of lower beam **195** and one in the bottom side of lower beam **195**, both holes being in vertical alignment with each other. Bottom rod **168** is disposed in lower beam **195** through holes **245**. Therefore, internal support structure **25** can rotate in relation to external support structure **30**.

Reference is again made to Fig. 2 and Fig. 6. A ball bearing **250** is placed at each hole **240** (Fig. 2) and **245** (Fig. 6) to ease twisting of internal support structure **25** within external support structure **30**.

Reference is again made to Fig. 3. Bottom rod **168** extends below lower beam **195** to enable connection to motor **45**. Motor **45** is disposed on the bottom side of lower beam **195**. Bottom rod **168** and motor **45** are connected, typically by a non-slip belt **260** or a gear configuration (not shown). Light sensor **50** is disposed, typically, on the topside of upper beam **200**. The mechanical connection between motor **45** and bottom rod **168** is configured to allow manual turning of inflatable balloon **15**, for example: when repair work is necessary or when the non-projected image on side **35** needs to be changed. External support structure **30** also includes a work platform (not shown) to enable repair workers to make repairs and change the non-projected image (not shown).

Reference is now made to Fig. 12, which is a schematic side view of inflatable balloon **15** being suspended. This can be achieved by mechanically connecting top rod **167** to a hook **262**. Hook **262** can then be used to suspend inflatable balloon **15** from above using another hook **263**. In such a case, external support structure **30** includes hook **262** and **263**. A counterweight **264** is deployed to counter the turning moment caused by the weight of the internal support structure **25** and the projector **20**. Counterweight **264** is typically deployed so that its center of gravity is on the side of ring **60** opposite to projector **20** and the majority of internal support structure **25**.

Counterweight **264** is typically connected to at least one of top rod **167** and bottom rod **168**.

Reference is now made to Fig. 13, which is a schematic side view of inflatable balloon **15** being supported from below. This is achieved by connecting bottom rod **168** to a base **261** on the ground or on a vehicle, or on top of a telescopic pole and using counterweight **264**. The counter weight is typically connected to bottom rod **168**.

Reference is now made to Figs. 3, 14 and 15. Fig. 14 is a plan view of the inflatable three-dimensional display of Fig. 1 in its collapsed state. Fig. 15 is a schematic representation of the operation of a system for controlling an inflatable display according to wind conditions that is operable in accordance with a preferred embodiment of the invention. A wind gauge **265** is disposed, typically, on the topside of upper beam **200** and the output of wind gauge **265** is sent to a control circuitry **270** (not shown). In block **275**, control circuitry **270** senses for a preset maximum wind speed. During this time period, inflator **55** is activated, thereby maintaining the inflation of inflatable balloon **15**. In block **280**, the preset maximum wind speed is sensed by control circuitry **270**. Control circuitry then initiates a collapsing mode. In block **285**, collapsing mode commences by control circuitry **270** turning off inflator **55**. In block **290**, control circuitry **270** initiates a short time delay, typically 30 to 60 seconds. In block **295**, control circuitry **270** initiates the contraction of linear actuators **155**, **165** thereby causing support arms **115**, **120** to fold, which in turn cause ring **60** to fold. The folding of ring **60** causes inflatable balloon **15** to

fold, thereby protecting inflatable balloon **15** from damaging wind conditions. In block **300**, a recovery mode for reestablishing inflatable balloon **15** can be initiated by remotely transmitting a signal, for example: by mobile telephone or by infrared to a sensor that is connected to control circuitry **270**. Alternatively, in block **305**, the recovery mode can be initiated automatically control circuitry **270** sensing for a wind speed below a second preset maximum. In block **310**, a wind speed below a second preset maximum is sensed by control circuitry **270**. In block **315**, control circuitry **270** initiates the recovery mode. In block **320**, control circuitry **270** initiates the recovery mode by expanding linear actuators **155**, **165** thereby causing support arms **115** and **120** to unfold, which in turn cause ring **60** to unfold. The unfolding of ring **60** causes inflatable balloon **15** to unfold. In block **325**, control circuitry **270** turns on inflator **55**.

Internal support structure **25** is typically configured to manually fold and unfold by manually overriding control circuitry **270** and manually turning off and on inflator **55** and by manually operating linear actuators 155, 165 or by other mechanical means.

It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather, the scope of the present invention includes both combinations and sub-combinations of the various features described hereinabove, as well as variations and modifications thereof that are not in the

prior art which would occur to persons skilled in the art upon reading the foregoing description.